ABSTRACT OF THE DISCLOSURE

Raw material supplying sources, namely a target and a microwave gun are provided in a vacuum chamber such that they oppose a substrate, and a main evacuation port is disposed closer to the microwave gun between both the raw material supply sources. A control system memorizes oxygen gas flow rate under a predetermined argon gas flow rate, and sputter film formation rates comprised of three modes of high-, middle- and low-speeds, namely, high-speed metallic species film forming mode, low-speed compound species film forming mode and intermediate film forming mode depending on the oxygen gas flow rate, as reference data. At the time of film formation under a predetermined argon gas flow rate, an oxygen gas flow rate and an argon gas flow rate corresponding to the high-speed metallic species film forming mode are selected. Then, both the gas flow rates are controlled so as to maintain the ratio of both the flow rates of the selected oxygen gas and argon gas, and then, a reaction process by operating a microwave gun having an oxygen gas introduction port and an oxygen exhaust port nearby and a film forming process by operating a sputter target having an argon gas introduction port nearby are executed alternately so as to execute pulse-like film forming process.